

REMARKS

In view of the above amendments and Applicants' comments stated herein, Applicants respectfully request an early and favorable action on the merits.

Claims 1-7, 15-16, 18-25, 27-32, 35-65 are under consideration in this application. Claims 8-14, 17, 26, 33-34 are being cancelled without prejudice or disclaimer. Claims 1-4, 7, 15-16, 20-22, 26-27, 30, 35-37 are being amended, as set forth above and in the attached marked-up presentation of the claim amendments, in order to more particularly define and distinctly claim Applicants' invention. New claims 40-65 are being added. All the new claims are supported by the specification. Applicants hereby submit that no new matter is being introduced into the application through the submission of this Supplemental Preliminary Amendment.

Present Invention

The magnetoresistive device (i.e., a magnetic tunnel junction device ("MTJ device")) of the present invention is provided with the following three characteristics:

- (1) A tunnel barrier layer comprises MgO_x .
- (2) Said MgO_x is a single-crystalline (001) MgO_x ($0 < x < 1$) or a poly-crystalline MgO_x ($0 < x < 1$) in which (001) crystal plane is preferentially oriented.
- (3) x is $0 < x < 1$. (Namely, if this is represented as "MgO crystals," the crystals have oxygen vacancy defects.)

The MTJ device of the present invention delivers the following performance:

- (i) A larger MR ratio (i.e., TMR ratio) at room temperature, i.e., exceeding 70% at room temperature);
- (ii) A lower discontinuous value*, i.e., 0.1 to 0.85 eV, in particular, 0.2 to 0.5 eV (*A discontinuous value, between the bottom of the conduction band of said tunnel barrier layer and the Fermi energy of at least one of said first and said second ferromagnetic layers, is smaller than an ideal discontinuous value (in the case where said tunnel barrier layer is formed by a perfect single-crystal MgO). The discontinuous value hereinafter is cited as the height ϕ of the tunnel barrier).
- (iii) A higher output voltage, i.e., more than 200 mV at room temperature.

Favorable consideration of this application as amended is respectfully solicited. Should there be any outstanding issues requiring discussion that would further the prosecution and allowance of the above-captioned application, the Examiner is invited to contact the Applicants' undersigned representative at the address and telephone number indicated below.

Respectfully submitted,

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